AMATEUR SATELLITE REPORT

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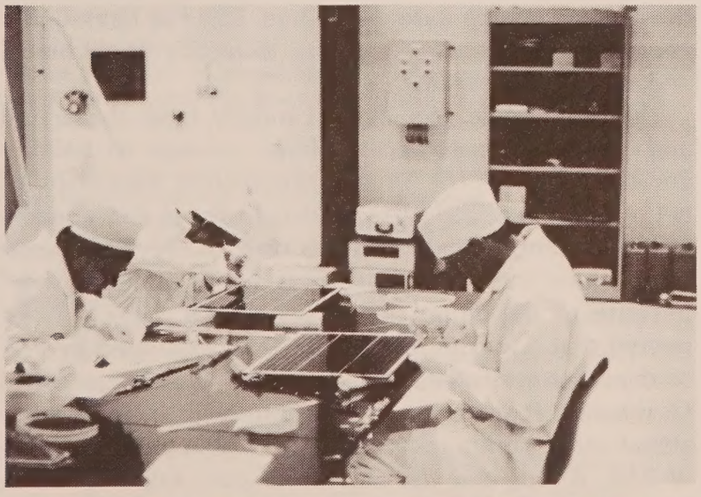
Phase III Ready For Launch

After years of planning dating back to the mid-seventies, the dream of a high-orbiting, broad band vhf-uhf amateur radio satellite is about to be realized.

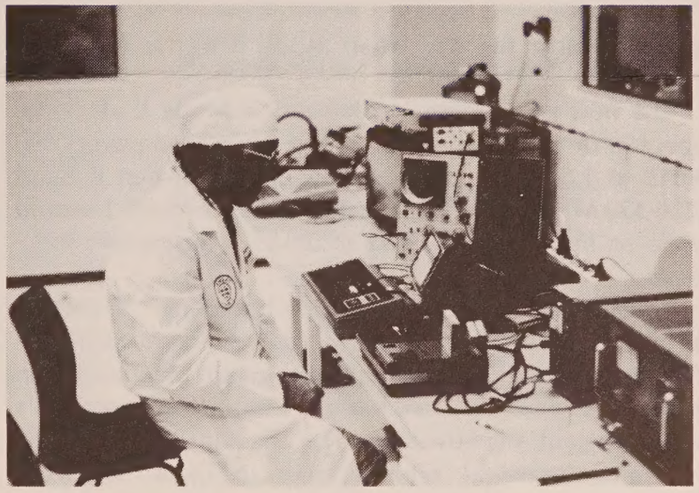
At press time Phase III sat atop the European Space Agency (ESA) Ariane launcher L6 on the steamy north coast of French Guiana, South America. Mounted inside a launch container called a Sylda, the spacecraft was completed and finally readied for launch on Wednesday, 1 June. At that point the spacecraft (s/c) had been completely verified for electrical performance and mechanical integrity. The propellents (N_2O_4, nitrogen tetroxide; UDMH, unsymmetrical di-methyl hydrazine) had been loaded and the s/c was, in space parlance, "closed out."

All indicators pointed to a successful launch when the launch window opens at 1159 UTC, 16 June 83. A final decision point on the exact date and time of the launch was due 6 June. (Tune AMSAT nets and ALINS for latest info on launch date/time. See related ALINS story elsewhere in this issue.

Planning for Phase III began with some preliminary discussions between Dr. Karl Meinzer, DJ4ZC, AMSAT DL President and colleagues in the U.S. Including Jan King, W3GEY and AMSAT founding President Dr. Perry Klein, W3PK. The early design concept of a three-pointed star, spin-stabilized s/c structure has prevailed. The actual Phase IIIB space frame structure does not differ noticeably from the early structural models. Electrically the Phase IIIB bird is far advanced over even its ill-fated predecessor, Phase IIIA.



Applying thermal coatings to the solar panels. (U. Gladisch, W. Mueller, G. Hardman)

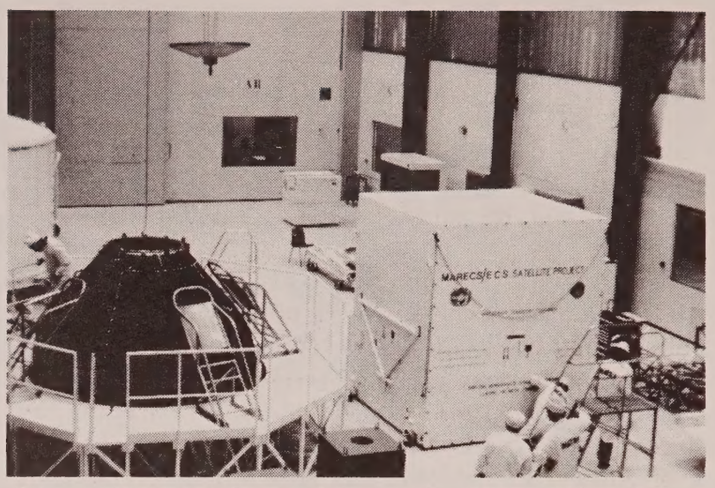


DJ4ZC verifies Phase IIIB performance with computer using telemetry system through umbilical.

Phase IIIA met an unfortunate end when on 23 May 80, a first stage engine anomaly cast the entire Ariane LO2 mission into the South Atlantic. Phase IIIA carried a single Mode B transponder (70 cm uplink, 2 meters down) in accord with the original, early concept devised in the mid-seventies. AMSAT-OSCAR 7 had been recently completed and the Mode B transponder aboard AO-7 had become enormously successful. It is still viewed in many quarters as the most successful transponder of all. Phase IIIA was to take the Mode B success of AO-7 and extrapolate that to an international scale.

Subsequent to the loss of Phase IIIA, it became apparent to the key planners of the replacement mission, Phase IIIB, that many factors had changed since the planning stages of Phase IIIA had transpired. More amateurs were on and WARC-79 had allocated more amateur satellite frequencies including key spots at 70 cm and 24 cm. With estimates of high populations migrating to the 150 kHz of Phase IIIB's Mode B transponder, the decision was taken to add a second transponder to act as a "safety valve" and insurance

Wolfgang Mueller (left) and Konrad Muller complete propellant system preparations.



Spacecraft in shipping containers prior to unpacking. Center, smaller white container is Phase IIIB. On left (dark object surrounded by work platform) is the Sylda, ECS-1 is on right.

policy against the day when Mode B traffic exceeded capacity.

The new mode came to be called Mode L after the spectral designation called "L Band." L Band covers 390 MHz to 1.55 GHz and is sandwiched between P Band (220-390 MHz) and S band (1.55-5.2 GHz). Mode L would yield an incredible 800 kHz of usable transponder spectrum.

Thus the s/c that now sits perched some 20 meters above the launch pad in its carbon filament structure coccoon (Sylda) is much, much more capable a bird than had ever been envisioned early in Phase III planning. It's even substantially advanced over the Phase IIIA vintage. A major technical breakthrough in linear amplifier technology called HELAPS has been employed in Phase IIIB for the first time anywhere. HELAPS is High Efficiency Linear Amplification by Parametric Synthesis. It raises the efficiency of the transponder power amplifiers notably and, though not featured prominently to date, represents a state-of-the-art advancement of not insignificant proportions. DJ4ZC and the AMSAT DL team perfected HELAPS at the Marburg laboratories and AMSAT members around the world will benefit from this hitherto obscure breakthrough in broad band linear amplifier design.

The command system that will support s/c operations is notably improved over the capabilities that existed to support Phase IIIA. Under the leadership of Dr. John DuBois, W1HDX, the team comprised some of the most able, well-prepared amateurs in the world who together will maintain the health and welfare of the amateur radio world's pride, Phase IIIB. Command team members include W3GEY and W3IWI at the AMSAT Lab (W3ZM) and command center at the Goddard Space Flight Center, Maryland, DJ4ZC and his team at AMSAT DL lab at the University of Marburg, West Germany, WØPN, WØLER, VE1SAT, W6PAJ, KL7GRF/W6, ZL1AOX and ZL1WN. Other stations at ZS1FE, JR1SWB and G3YJO may be available for command activities later. The command stations will employ specially developed hardware (IFDEM/AFDEM, BitRegen, Trump, etc.) and an advanced version of the DJ4ZC-originated, Forth-like computer language called IPS. WØPN provided adaptation of IPS to many AMSAT systems and is the "expert-in-residence" in this facet of the complex Phase III program "office."

With roughly a week to go until launch, the excitement level among amateur space afficiandoes as well as the general amateur radio community had noticeably risen. Thanks to a growing media campaign to alert the ham world to the impending milestone, many hams are for the first time taking an interest in the progress of Phase III. Many skeptics remain to be convinced, however, recalling the letdown attending the Phase IIIA debacle. Comments range from, "Good luck" to "Riding that #$&%# French rocket again?" to "We're ready and waiting, so let's go!"

The launch of Phase IIIB has been repeatedly postponed as a consequence of serious problems with the Ariane launcher. The L5 launch 9 Sept. 82 failed when a third stage turbopump gear ruptured due to lubrication anomalies. Lost with L5 were the MARECS-B and Sirio 2 s/c. Lost as well was the appearance of momentum garnered with the launch successes of LO3 and LO4. After the L5 loss Phase IIIB was swapped with the L7 launch to L6. Exosat, which had been on L6 was eventually removed completely and launched on a U.S. Delta 3914 launcher last month. Because of the science mission of Exosat (X-ray survey of the solar system and deep space), it had to be launched in a window in May. Diagnosis, repairs and tests of the remedies to the third stage turbopump lubrication system has delayed L6 until the present launch date of 16 June. ESA has been under enormous and growing pressure to rectify its technical and schedule problems.

The pressure of ESA derives mostly from the actual and potential customers seeking passage to geosynchronous orbits. The recent spectacular successes of NASA's Space Shuttle has tended to focus and concentrate the competitive pressures on ESA. Several important Ariane customer/passengers have "jumped ship" because of the delays in, especially, L6. Thus it is expected that a maximum effort will be expended by ESA to demonstrate satisfactory "repairs" with a successful L6 mission. It seems to be the consensus in the professional space community that L6 is THE key to the future of ESA, Ariane and the marketing arm, Arianespace. A success with L6 would give a record of 4 out of 6. A failure would give a "scorecard" of 3 of 6. Given the suc-

cess of Shuttle, most analysts believe Ariane would suffer a fatal blow if L6 is anomalous.

AMSAT officials have commented that they feel quite confident that the prior problems with Ariane have been successfully countered. Moreover, according to AMSAT Chairman John Browning, W6SP, "The launch immediately following a failure is possibly the best one to be riding." He goes on to explain that in his experience procedures and equipment are usually "tweaked" to maximum effectiveness when a program has suffered a setback and treks out on the "comeback trail."

The stage is thus set for the spectacular on 16 June when the expectations of a million hams meet the lifeline of the most complex amateur radio contrivance ever. AMSAT's Phase IIIB, a quarter million dollars plus, its co-passenger, ECS-1 wait quietly humming their telemetry through the launch gantry umbilical to light up the CRTs of the anxious engineers in the blockhouse. On a steamy morning next Thursday all will leap forth from the jungle floor into the frigid blue-then-blackness of the sky above. Riding on the plume amongst the aluminum, silicon and steel are the earnest hopes of perhaps millions. The L6 is bound to make history. AMSAT and amateurs world-wide want dearly for it to be a positive milestone. Will the stage hold great tragedy or great joy...the third act of a great melodrama is about to unfold. Hold your breath!

Planned Telemetry Format

Typical Frame Structure

HI HI AMSAT OSCAR 10 AT XX:XX:XX UTC
ORBIT XXX MA XXX/256 - note 1
UBAT XX.X VOLTS TBATT XX.X C IARRAY X.X. A
SA −/+ XX DG - note 2
SPIN XX RPM
SATELLITE STATUS:
FIRST MOTOR FIRING AND ORBIT CHANGE EXPECTED DURING
ORBIT 3 - note 3
TRANSPONDER IS OFF UNTIL ABOUT ORBIT 10
LISTEN DAILY TO THIS BULLETIN FOR LATEST OPERATING NEWS
AT THE HOUR AND AT PLUS 30 - note 4

Note 1 - MA refers to the Mean Anomaly with 0 being at perigee

Note 2 - UBATT = battery voltage; TBATT = battery temp. in deg. C; IARRAY = current in Amps of the Solar array; SA = sun angle in plus or minus degrees; SPIN = space craft spin in Revs per minute.

Note 3 - For reference, the orbit number increments at each perigee, with perigee zero occurring before 3rd stage shutdown and apogee zero occurring while the bird is over the Indian Ocean.

Note 4 - The schedule planned for usage of the General Beacon in the early orbits of AMSAT-OSCAR 10 follows:

Minutes past hour	Telemetry Mode
00 - 05	CW & RTTY BULLETIN
05 - 15	PSK used on General Beacon (Telemetry)
15 - 25	Possible Ranging otherwise PSK telemetry
25 - 30	PSK telem.
30 - 35	CW & RTTY BULLETIN
35 - 45	PSK used on General Beacon (Telemetry)
45 - 55	Possible Ranging otherwise PSK telemetry
55 - 60	PSK telem.

Phase IIIB Launch Timeline

The following is an updated time line for certain events in the Phase IIIB mission, starting with Ariane first stage ignition (HO) and ending with the first motor firing at fourth apogee. The clock time entries are based on a launch at the opening of the window on 16 June; a delay in the launch would of course not affect the elapsed time column.

The "AOS/LOS" times early in the mission are only of academic interest, since the transmitter will most likely be kept off for five hours after launch to allow outgassing to hard vacuum. Times of various events during launch are approximate, as we do not yet have ESA final values for these (most of the entries in the ESA manual say "TBD").

Elapsed Time	Clock Time: UTC	Event
+00:00:00	Thu Jun 16 11:59:00	Elapsed time zero (HO)
+00:00:03.4	Thu Jun 16 11:59:03	Liftoff
+00:01:25	Thu Jun 16 12:00:25	Maximum dynamic pressure
+00:02:18	Thu Jun 16 12:01:18	First stage separation
+00:04:08	Thu Jun 16 12:03:08	Fairing jettison
+00:04.32	Thu Jun 16 12:03:32	Second stage separation
+00:14:03	Thu Jun 16 12:13:03	Perigee
+00:14:05	Thu Jun 16 12:13:05	Third stage shutdown
+00:15:44	Thu Jun 16 12:14:44	ECS-1 separation
+00:17:24	Thu Jun 16 12:16:24	Phase IIIB separation
+00:21:54	Thu Jun 16 12:20:54	AOS ZS1FE
+01:01:25	Thu Jun 16 13:00:25	AOS JR1SWB
+01:18:58	Thu Jun 16 13:17:58	LOS ZS1FE
+01:58:05	Thu Jun 16 13:57:05	AOS ZL1AOX
+02:31:45	Thu Jun 16 14:30:45	AOS ZS1FE
+03:18:41	Thu Jun 16 15:17:41	LOS ZL1AOX
+05:00:00	Thu Jun 16 16:59:00	Transmitter turns on
+05:03:18	Thu Jun 16 17:02:18	AOS DJ4ZC
+05:30:22	Thu Jun 16 17:29:22	Apogee #1
+09:55:03	Thu Jun 16 21:54:03	LOS DJ4ZC
+09:58:07	Thu Jun 16 21:57:07	LOS ZS1FE
+10:38:20	Thu Jun 16 22:37:20	LOS JR1SWB
+10:46:40	Thu Jun 16 22:45:40	Perigee
+11:11:36	Thu Jun 16 23:10:36	AOS WØPN
+11:11:44	Thu Jun 16 23:10:44	AOS W1HDX
+16:02:58	Fri Jun 17 04:01:58	Apogee #2
+20:58:37	Fri Jun 17 08:57:37	LOS WØPN
+21:03:43	Fri Jun 17 09:02:43	LOS W1HDX
+21:19:16	Fri Jun 17 09:18:16	Perigee
+21:43:43	Fri Jun 17 09:42:43	Aos JR1SWB
+21:51:15	Fri Jun 17 09:50:15	AOS ZL1AOX
+26:35:34	Fri Jun 17 14:34:34	Apogee #3
+30:22:12	Fri Jun 17 18:21:12	LOS ZL1AOX
+31:11:24	Fri Jun 17 19:10:24	AOS ZL1AOX
+31:30:09	Fri Jun 17 19:29:09	LOS ZL1AOX
+31:39:05	Fri Jun 17 19:38:05	LOS JR1SWB
+31:51:52	Fri Jun 17 19:50:52	Perigee
+32:13:45	Fri Jun 17 20:12:45	AOS W1HDX
+32:24:41	Fri Jun 17 20:23:41	AOS ZS1FE
+32:39:16	Fri Jun 17 20:38:16	AOS DJ4ZC
+34:53:49	Fri Jun 17 22:52:49	AOS WØPN
+36:08:10	Sat Jun 18 01:07:10	Apogee #4 - first burn

Special ASR Renewal Offer

The cost of producing *ASR* is rising and consequently we are obliged to share the increase with our valued subscribers. As a special offer to present subscribers, they may renew at the current rate for up to 3 years through 30 June 83. Beginning 1 July 83 the new rates will be $22 per year in the U.S., Canada and Mexico; $30 elsewhere. May we have your continued support? We appreciate it and sincerely hope you will advantage yourself of this offer while it remains in effect and that you will continue with *ASR*; acknowledged one of the best newsletters in the world!

ALINS Schedule

The following is the Phase IIIB AMSAT Launch Information Network Service (ALINS) schedule based on a June 15-18 launch:

Pre-launch bulletins start June 11 UTC and Post-launch bulleting end June 19 UTC.

Pre Launch Bulletins

Eastbound from east coast USA via W2BXA and W2LV			Westbound from west coast USA via WA6GFY		
Time	**Freq.**	**Target**	**Time**	**Freq.**	**Target**
(UTC)	*(MHz)*		*(UTC)*	*(MHz)*	
1800	21.280	Europe	1900	21.280	VK-ZL
1805	21.280	Africa	1910	14.280	VK-ZL
1815	14.280	Europe	2300	21.280	JA-DU
1820	14.280	Africa	2310	14.280	JA-DU

USA coverage via W1AW
Normal W1AW bulletin frequencies, times and modes.

UK-Europe from G3AAJ
Starting June 9 at 1800 UTC on 3.780 MHz.

ALINS stations for Launch Day

W1AW - Newington, Conn. 1.890 3.990 7.290 14.290 21.390 28.590 50.190 147.555 (standard W1AW voice bulletin frequencies). All transmissions intended for USA coverage.

WØRPK - Des Moines, Iowa 3.850 MHz

NØAN - Ames, Iowa 7.180 MHz (Audio feed from WØRPK via KØCY 146.01/.61 repeater.)

AIØZ - Ames, Iowa 14.260 MHz (Audio feed from WØRPK via KØCY 146.01/.61 repeater.

WA6GFY - San Francisco, CA 7.170 MHz 14.250 Both transmissions intended for USA coverage.

WA3TAI - Washington, DC 14.280 MHz

W3OZ - 21.28 Both transmissions beamed toward Europe/Africa.

G3AAJ - UK 7.080 MHZ UK-Europe coverage.

G3RWL - UK 3.780 MHz UK coverage (U. of S. command station calls teleconference bridge and link audio to G3AAJ via 70 cm who will link to G3RWL via 2M.)

WH6AMX - Hawaii

KH6SP - 7.182 MHz

? - 14.265 MHz Japan

KH6SP - 14.285 MHz (VK-ZL)

Post Launch Bulletin and Nets

AMSAT will follow normal net schedule before launch. Nets will be run on 75M every night following launch through following Tuesday. Use normal time and frequency schedule. A special 15M/20M net should be run on Saturday following the standard Sunday schedule. Stations should maintain a watch on 28.878, 21.280 and 14.280 MHz to respond to info requests.

Key Launch Facts

The following synopsis presents the key launch facts supplementing the extensive Time Line article presented elsewhere in this issue.

The primary launch window is 16 June, 1159 to 1328 UTC. Others are 18 June, 0053 to 0221 UTC (17 June in U.S.A. — night launch) and 15 June, 1159 to 1328 UTC (not likely at press time).

Beacon Frequencies:

Mode B General Beacon 145.810 MHz (expected use)
Engineering Beacon 145.987 MHz

Mode L General Beacon 436.040 MHz
Engineering Beacon 436.020 MHz

Transponder Frequencies:

Mode B Input 435.025 to 435.175 MHz
Output 145.978 to 145.828 MHz

Mode L Input 1268.05 to 1268.85 MHz
Output 436.96 to 436.15 MHz

No transponder use is permitted until officially released by AMSAT for use. Critical ranging tests must be accomplished WITHOUT interference.

The General Beacon will be the first to come on. It will be automatically activated five hours after launch. First to hear it will be those in Europe. AOS at DJ4ZC will be at T + 5:03 when the satellite is south of Sri Lanka. LOS at DJ4ZC will be at T + 9:55.

After deployment from Sylda at T + 00:17:24 P3B will have a flat, Z-axis spin of about 10 RPM; its apogee will be at 35,876 km with perigee at 200 km.

Orbital determination wil be made initially by ESA and NASA. AMSAT will attempt to correlate its ranging data with that. Later AMSAT's tracking will be used exclusively.

Initial kick motor firing is scheduled for about T + 36 hours. A primary burn lasting approximately 40 seconds is planned. This should raise the perigee to about 1000 km and change the inclination slightly from its initial 8.6 degrees to about 11 degrees. The kick motor will be fired on the fourth apogee according to the plan. After firing, the critical ranging tests will occur to determine the new orbit and the spacecraft's attitude and spin. After reorientation the final kick motor firing will burn to depletion of the propellants. The result should change the inclination to about 57 degrees and set the argument of perigee in the range of 180 to 185 degrees. The second burn should negligibly affect the apogee and perigee, however.

The omni antennas will probably be used until final orbit is attained.

Silent Key Is Mourned

ASR joins all AMSAT members in mourning the passing of Fred Siebert, K3PNL, of Maryland. Fred had been a long-time contributor to AMSAT and was especially helpful in translating German text to English. He certainly will be missed.

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